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## Note on calcareous algæ from Michigan.<sup>1</sup>

D. P. PENHALLOW.

In the latter part of the summer of 1891, Sir Wm. Dawson received from Mr. B. W. Thomas, of Chicago, some very curious and interesting calcareous pebbles formed by algæ. They were transferred to me with the request that I should report upon the nature of the organisms giving rise to them. These pebbles were found in considerable numbers in certain Michigan ponds by Dr. J. W. Velei, secretary of the Chicago Academy of Natural Sciences. The specimens were found on a smooth, sandy bottom, under about four feet of water, and the collector states that when fresh "they had so soft and slippery a feeling" that he thought they were alive. Those which reached me were said to be representative of the average size. They were found to be irregularly ellipsoidal with a thickness of about 40<sup>mm</sup> and a diameter of about 60×80<sup>mm</sup>. Light ash gray, the surface was found chiefly smooth, but here and there with depressions of various sizes, frequently merging into actual cavities. The pebbles are not solid, but appear as a thickish shell-like mass surrounding an irregular cavity, such as might be conceived to arise from a progressive internal decay, concurrently with an extension of the mass from without.

Upon treating a portion of a pebble with acid to remove the incrustation of lime, it became evident that we had to deal not with an individual organism, but with a community possessing considerable diversity of plant forms, while it was also evident that the growth of the mass had involved the inclusion of a variety of foreign bodies, some of which at least, might have served as a base for the algal growth.

From my notes taken at the time, it appears that owing to the imperfect condition of some of the plants, it was not possible to determine them conclusively in all cases. There were found, however, numerous diatoms, fragments of *Ædogonium*, *Gleocystis*, *Calothrix* and *Urococcus*, and in much larger quantity, plants of *Sirosiphon informe* Kg. Pine pollen and fragments of coniferous wood were also noted as com-

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<sup>1</sup> I desire to acknowledge valuable suggestions by Dr. Farlow in the preparation of this note.

mon inclusions. The body of the specimen was found to consist of a plant which could not be satisfactorily determined. The material was therefore referred to Dr. Farlow, who not only confirmed the observations previously made, but ascertained that the dominant species was *Dicothrix gypsophila* (Ag.) B. & Flk. From the facts thus noted the inference was drawn that the pebbles might be regarded as veritable museums which would probably disclose some new form each time a fresh examination was made.

More recently some of these pebbles were sent to Mr. E. Grove, of England, who in turn transferred them to Mr. George Murray, of the British Museum. Mr. Grove undertook the determination of the diatoms, and has added considerably to our knowledge of the composition of these curious communal growths, by the publication of a list embracing 24 genera and 100 species and varieties.<sup>2</sup> This somewhat extensive diatomaceous flora is, nevertheless, hardly to be regarded as playing any special rôle in the formation of the pebbles beyond the fact of simple association, a relation which is readily understood when we recall the very universal distribution of these minute organisms, and the readiness with which they take up their abode in almost any situation.

The larger forms of plants found in the pebble were determined by Mr. Murray, who has given, in addition to other figures, excellent drawings showing the general external characteristics of the pebbles. His determination of the components showed that, "the predominating kind was clearly a species of *Schizothrix* while mixed with it there were other forms, notably filaments of *Stigonema* and *Dicothrix*."

Not arriving at a satisfactory conclusion respecting the first, Mr. Murray referred the matter to M. Gomont as final authority, who reported that, "the interior of the calcareous mass is formed of entangled filaments; they appear to belong to a *Schizothrix*, but which?" Finally he says, "I do not think one can make anything very distinctly out of this specimen except *Schizothrix fasciculata*, which undoubtedly occurs in abundance."<sup>3</sup> Excellent figures of this plant are given by Mr. Murray.

It would thus appear that from two independent sources we have results which, while agreeing in many respects, fail

<sup>2</sup> E. Grove.—Diatomaceous remains observed in preparations and washings of calcareous algæ. London. 1895.

<sup>3</sup> George Murray.—Calcareous pebbles formed by algæ. London. 1895.

to agree as to the character of the dominant plant, and the idea derived from the observations of Dr. Farlow and myself, that there is no element of constancy in the composition of the flora of these pebbles, beyond the fact that two or three species are in excess, would thus seem to be greatly strengthened.

Apart from the species found in the pebbles, but which could hardly have played any part in their original formation, it will be seen that there are present two and perhaps three species which, by their concurrent growth, may have produced them. It would be of great interest to know whether these large concretions are due to the growth of a single species, or, if to the combined growth of several species, the relative part which each plays. It is, therefore, to be hoped that some observer will watch the locality and obtain quite young material which alone will afford the means of settling this interesting question.

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